Jurassic and Cretaceous Formations of the Middle West," by Prof. John B. Hatcher, of Pittsburg.

"Hints on the Classification of the Arthropoda, the Group a Polyphyletic One," by Prof. Alpheus S. Packard, of Providence.

"Anatomy of the Floscullariidæ," by Prof. Thomas H. Montgomery, Jr., of Philadelphia.

"A Résumé of the Composition of Petroleum from Different Fields," by Prof. Charles F. Mabery, of Cleveland.

APRIL 4.—MORNING SESSION, 10 A.M.

President SMITH in the Chair.

The following papers were read:

"The Most Insidious Source of Error in Quantitative Chemical Research," by Prof. Theodore W. Richards, of Cambridge, Mass.

"A Further Classification of Economies," by Prof. Lindley Miller Keasbey, of Bryn Mawr, Pa.

"Some Features of the Supernatural as Represented in Elizabethan and Jacobean Plays," by Prof. Felix E. Schelling, of Philadelphia.

"The Hamites and Semites in the Tenth Chapter of Genesis," by Prof. Morris Jastrow, Jr., of Philadelphia.

"The Warfare Against Tuberculosis," by Dr. Mazÿck P. Ravenel, of Philadelphia.

ON A NEW GENUS OF HYDROID JELLY-FISHES.

BY WILLIAM KEITH BROOKS.

(Plate I.)

(*Read April 4, 1902.*)

GENUS DICHOTOMIA.

Diagnosis of the Genus.—Hydroid jelly-fishes with four radial canals which divide dichotomously two, three, four, or more times,

and open into the circular canal by sixteen, thirty-two, or more distal branches; with two sorts of tentacles—hollow ones and solid ones; with a simple mouth and with a single circumferential gonad which extends from the wall of the manubrium on to the radial canals and their branches.

Dichotomia cannoides (Plate I, Figs. 1, 2 and 3).

Diagnosis of the Species.—Bell subcylindrical, somewhat higher than wide, with a conical apex. Manubrium fusiform, widest at about the middle of its upper half. The four radial canals branch dichotomously four (or more?) times. Near the apex the four primary canals arise in two pairs from the ends of a short transverse canal. There are sixteen long hollow tentacles, and about thirty-two (or more?) short solid tentacles. The reproductive organ extends from the wall of the manubrium on to the radial canals and their branches for about half their length.

Special Description.—The four radial canals do not arise independently and directly from the aboral end of the stomach, but in pairs from the ends of a short transverse canal, in such a way that the only planes which divide the jelly-fish into symmetrical halves are the two primary interradial planes. When it is divided in either of these planes each half is itself bilaterally symmetrical, consisting of halves which are reversed copies of each other. In all my larger specimens each of the primary radial canals was divided dichotomously three times, so that there were eight secondary canals, sixteen tertiary and thirty-two terminal branches. In one specimen, which is shown in Fig. 1, one of these terminal canals was again divided into two, so that there were thirty-three instead of thirty-two terminal branches. It is therefore probable that the number of branches continues to increase with the age of the jelly-fish, and that older specimens may have sixty-four or more terminal branches. The subumbrella consists of two strongly contrasted regions: an upper opaque portion which is nearly hemispherical and which contains the arches formed by the reproductive organ on the arched subdivisions of the radial canals, and a lower portion which is cylindrical and transparent. About one-half of the total length of the system of canals is joined to the reproductive organ, which extends from the wall of the manubrium to the radial canals in a system of groined arches, dividing the upper part of the subumbrella into pockets which are closed above, open

below, and equal in number to the terminal branches of the radial canals. All of these pockets open at the same level below, but the sixteen pockets of the fourth set are very shallow, the eight pockets of the third set and the four of the second set are deeper, and the four primary pockets of the first set reach nearly to the apex of the subumbrella. The primary tentacles are stout, hollow, contractile, and when the jelly-fish is swimming they are stiffly extended with their tips coiled into compact spiral whorls. There are sixteen of these tentacles in every specimen that I have examined. The young specimen which is shown in Fig. 2 has sixteen distal radial canals, and a hollow tentacle arises from the circular canal in the plane of each branch of each radial canal. In the older specimen which is shown in Fig. 1 the hollow tentacles are still sixteen in number, although the distal canals are twice as numerous and although the hollow tentacles are now in the radii of dichotomy instead of being, as they are in the younger specimen, in the radii of the distal branches. The solid tentacles are short with little power of extension or contraction; they are usually turned outward and upward over the margin of the bell, and they remind one of the solid tentacles of the Geryonidæ. In all the specimens that I have examined they are equal in number to the distal branches of the radial canals: sixteen in the young jelly-fish shown in Fig. 2, thirty-two in those with thirty-two canals and thirty-three in the one shown in Fig. 1.

Color.—The gonads and the manubrium of old specimens are opaque white. The bell and the subumbrella and the tentacles are nearly colorless. The radial canals, the circular canal and the axes of the hollow tentacles are colored in young specimens by pigment-granules of a brownish-orange.

Size.—The bell is about one-third of an inch high and a little less than one-fourth of an inch in diameter.

Locality.—Several specimens were taken at high tide in an inlet from the open ocean in the Bahama Islands, near Nassau, in 1887, and at Bimini and at Green Turtle, in the Bahama Islands, in 1886 and 1888. It is common and widely distributed among the Bahama Islands.

If the analytical key which Haeckel gives in his *System der Medusen* were to be followed, the genus Dichotomia would belong among the "Leptomedusæ," in the family Cannotidæ, in the subfamily Williadæ, and in or near the genus Proboscidactyla (*System*

der Medusen, p. 158), although it is so different from the Williadæ and in fact from all the "Leptomedusæ" that it may turn out to be a tubularian jelly-fish, or "Anthomedusa." The simple manubrium and mouth, the hollow tentacles and the origin of the gonad in the wall of the manubrium are all points of agreement with the "Anthomedusæ." The solid tentacles have an axis made up of a single row of chorda cells, but as tentacles of this sort are found in undoubted tubularian jelly-fishes they afford no ground for excluding the genus Dichotomia from this group.

Prof. Walcott has described, from the Lower Cambrian of Alabama, certain remarkable fossils (*Fossil Medusæ*, by Charles Doolittle Walcott: Monographs of the United States Geological Survey, xxx, Washington, 1898) which he regards as the remains of Medusæ, and it is worthy of note that if the Medusa which is here described were slightly distorted by pressure the digestive and reproductive organs would exhibit some resemblance to one of the surfaces of some of Walcott's most characteristic types. At his suggestion I made a model in clay of the reproductive organs of Dichotomia in order to exhibit this resemblance, and Fig. 3 was drawn from this model. The resemblance lends additional support to the opinion that the Cambrian fossils are the remains of Medusæ, although it does not indicate that there is any relationship between Dichotomia and the fossils. In fact the resemblance is only superficial. In all the general details of their structure the Cambrian Medusæ must have been very different from the one that is here described.

The notes and drawings for this paper were made in 1888, although I have been forced to delay their publication.

Explanation of Plate I.

Fig. 1. An adult specimen of *Dichotomia cannoides*, enlarged about six diameters. From a drawing made at Nassau, New Providence, in 1886.

Fig. 2. A young specimen, enlarged about twenty diameters. From a drawing made by R. P. Bigelow at Bimini, Bahama Islands, in 1887.

Fig. 3. A clay model of the reproductive organs of Fig. 1.